DRAGONFLIES FROM THE LAOS COUNTRY.

By Lt. Col. F. C. Fraser, I. M. S., F. E. S.

The collection of dragonflies made by Dr. A. Kerr from the Laos country contains 95 specimens representing 33 genera and 42 species, of which 12 are new to science whilst others are extremely rare.

The late Réne Martin listed for Siam, Tonkin, and Annam 139 species, to which have been added another 13 by Williamson and myself, making a total of 152 species. The Laos country, lying as it does surrounded by these countries, must have a fauna largely identical, so that the present collection probably represents that one-third of its actual fauna.

With the exception of *Orthetrum triangulare* Selys, which is distinctly palaearctic in nature if not in its distribution, the whole of the fauna represented here is Oriental and Malaysian in character. Some species appear to have their zoo-centres situated here, such as *Mnais*, *Echo*, *Leucopteryx*, and *Orolestes*, whilst other species are peculiarly dominant. Just as *Pseudophaea splendens* has become the dominant species of the genus in Ceylon, *fraseri* to the north of the Palghat Gap in Western India, *cardinalis* equally so to the south of same gap, and *variegata* in Java, so *P. masoni* appears to have crowded out other species of the genus in Laos and Siam generally. Where a species has thoroughly established itself, it appears to be able to preserve its domination over others of the same genus for an indefinite period, for we see this phenomenon, as exemplified by *Pseudophaea*, paralleled again and again in the order Odonata.

The southeast corner of Asia as represented by Tonkin, Annam, Cambodia, Laos, and Siam, together with the adjacent strip of Tenasserim, is probably the richest entomological area in the world and may well have been the cradle of organic life on this globe; certainly in no other part of the world do we find such an intensity of rich and varied dragonfly-life as here.

Doubtless many new species still await discovery and among these are the opposite sexes of new species described below—*Protosticta robusta* and *trilobata*, *Drepanosticta anascephala*, *Coeliccia montana*, *Ceriagrion pallidum*, *Burmargiolestes flaviceps*, *Calopteryx laosica*, and *Devadatta multinervosa*, the female of the interesting *Orolestes selysi*, and the male of the huge *Echo maxima*.

LIST OF SPECIES OF DRAGONFLIES FROM THE LAOS COUNTRY.

Order Odonata.

Suborder Zygoptera.

Subfamily Platystictinae.

Protosticta robusta sp. nov.
Protosticta trilobata sp. nov.
Drepanosticta anascephala sp. nov.

Subfamily Platycneminae.

Copera marginipes Ramb.
Coeliccia montana sp. nov.
Coeliccia chromothorax (Selys).
Calicnemis erythromelas Selys.

Subfamily Protoneurinae.

Caconeura verticalis verticalis Selys.

Subfamily Coenagriinae.

Ceriagrion azureum (Selys).
Ceriagrion pallidum sp. nov.
Ceriagrion olivaceum Laid.
Archibasis mimetes praeclarum (Fras.).

Subfamily Synlestinae.

Orolestes selysi Macl.

Subfamily Megapodagriinae.

Burmargiolestes flaviceps sp. nov.

Subfamily Libellaginae.

Libellago lineatus lineatus (Burm.).
Rhinocypha biforata biforata Selys.
Rhinocypha perforata perforata (Perch.).
Rhinocypha iridea Selys, race *kerri*.
Rhinocypha fenestrella fenestrella Ramb.

Subfamily Epallaginae.

Pseudophaea masoni Selys.
Allophaea brunnea (Selys).

Subfamily Agriinae.

Neurobasis chinensis (Linn.).

Vestalis gracilis (Ramb.).
Mnais earnshawi Will.
Mnais andersoni Selys.
Leucopteryx hetaerinoides gen. et sp. nov.
Calopteryx laosica sp. nov.
Matrona basilaris basilaris Selys.

Subfamily Amphipteryginae.

Devadatta multinervosa sp. nov.

Suborder Anisoptera.

Subfamily Libellulinae.

Amphithemis kerri sp. nov.
Lyriothemis bivittata Selys.
Cratilla lineata (Brauer).
Orthetrum triangulare Selys.
Diplacodes trivialis (Ramb.).
Neurothemis fulvia (Drury).
Neurothemis fluctuans (Fabr.).
Brachythemis contaminata (Fabr.).
Trithemis aurora (Burm.).
Zygonyx immaculata sp. nov.

Subfamily Corduliinae.

Macromia sp.

Subfamily Gomphinae.

Macrogomphus borikhanensis sp. nov.
Onychogomphus sp., saundersii Selys ?

Protosticta robusta sp. nov.

Female. Abdomen 42 mm. Hindwing 26 mm. Male unknown.

Head: labium blackish brown; labrum, bases of mandibles, anteclypeus and genae turquoise blue, the former broadly bordered with black, especially medially where the black invades the blue at two points; eyes black or probably dark blue during life; frons, vertex and occiput black, the vertex with a median pale brown area just posterior to the ocelli (this possibly an artifect); distal end of basal segment and the whole of the penultimate segment of antennae white.

Prothorax jet black at sides, bluish on dorsum and sub-dorsum, the middle lobe marbled with brown, the posterior lobe rounded but with a scale-like prolongation on each side.

Thorax steely black as far out as the antero-lateral suture, blue laterally with a very broad steely black oblique band on the postero-lateral suture and adjacent portion of metepimeron. Legs pale yellowish or white with a fine black line posterior to the femora and a similar one on flexor surface of tibiae.

Wings very long and rather broad for the genus; pterostigma with coastal side much shorter than the posterior, distal side convex, proximal side very oblique, covering 1 cell, black finely framed in yellow; 22 postnodal nervures in forewings, 20 in the hind; $Riv + v$ arising slightly distal of the nervure descending from the node.

Abdomen black with white or pale blue basal annules to segments 4 to 7, and ventro-lateral spots on segments 2 and 3; segment 1 bluish laterally; segment 9 with a diffuse pale bluish white spot on each side. Anal appendages shortly conical, black; vulvar scales extending beyond end of abdomen.

Habitat.—Taweing, Laos, about 800 m. The type, a female taken by Dr. A. Kerr, April 6, 1932, differs from other species of the genus by its very high nodal index. A very robust species and certainly not conspecific with the following species which is much slenderer and smaller.

Protosticta trilobata sp. nov.

Male. Abdomen 42 mm. Hindwing 20 mm.

Head: labium dirty yellow; labrum and bases of mandibles turquoise blue heavily bordered with black; rest of head black; eyes dark brown or bluish during life.

Prothorax palest blue or creamy yellow, the posterior lobe blackish brown.

Thorax bronzed black on dorsum as far lateral as the antero-lateral suture; laterally pale blue with a narrow oblique black stripe on the postero-lateral suture. Legs yellow, femora with a black stripe on the extensor surface, tibiae with a similar stripe on the flexor surface.

Wings hyaline; pterostigma slightly longer than broad, black framed finely in white and thick black nervures; 14 post-nodal nervures in forewings, and the same in the hind; *Riv* + *v* arising slightly distal to the nervure descending from the node.

Abdomen blackish brown on dorsum and sides, this colour deepening to form broad black apical annules on segments 3 to 6; segments 3 to 7 with very broad pale blue basal annules covering about one-fifth of each segment but rather less than this on segment 6; segments 1 and 7 blue laterally; segments 8 and 10 entirely black, whilst segment 9 is entirely pale azure blue.

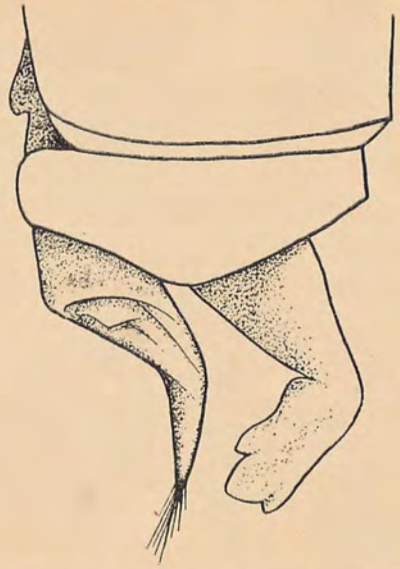

Fig. 1. *Protosticta trilobata* sp. nov., male. Anal appendages seen from the left side.

Anal appendages black; superiors twice as long as segment 10, broad at base, constricted at the middle, then broadening and hollowed out within in the apical half which is broadly trilobate at apex; at the junction of basal and apical halves the appendix strongly angulated inwards and downwards so that the apices of the two appendages meet. Inferiors broad at base, then tapering and directed upwards for a short distance, the apical half strongly angulated backwards and a little downwards and tapering to a fine point which bears a pencil of stiff hairs.

Habitat.—Muang Cha, Laos, about 1,100 m., April 28, 1932. A single male collected by Dr. A. Kerr. This species is related to

P. uncatus Fras., from the S. Shan States but differs from it by the labrum very broadly bordered with black and the differently shaped superior anal appendages. It agrees with it by the curious formation of the inferior anal appendages and the blue colour of segment 9. It bears a higher nodal index than *P. uncatus*. Related also to *P. foersteri* Laid., especially by the shape of the inferior anal appendages which however are more robust and broader at the base than in this species. The three species form a distinct group within the genus.

Drepanosticta anascephala sp. nov.

Male. Abdomen 43 mm. Hindwing 27 mm.

Head: labium pale yellow tipped with brown; labrum, bases of mandibles and anteclypeus turquoise blue, the former broadly bordered with black; antennae with the distal end of basal segment and basal end of penultimate segment white; rest of head black; eyes black or dark blue during life.

Prothorax blackish brown, the sides of the anterior lobe and a narrow stripe along the sides of the middle lobe pale blue.

Thorax bronzed black on dorsum as far as the antero-lateral suture, yellow or pale blue laterally with a thick oblique black stripe on the postero-lateral suture; beneath yellow. Legs yellow, femora black on extensor surface, tibiae black with a fine yellow line on the inner and outer surfaces.

Wings hyaline; pterostigma quadrate, covering rather more than 1 cell, black finely framed in yellow; 18 to 19 postnodal nervures in forewings, 18 in the hind; *Ab* situated widely distal of *Ac* and running from the posterior border of wing to the underside of discoidal cell; *Riv + v* arising widely distal of the nervure descending from the node.

Abdomen blackish brown, this colour deepening to form broad black apical annules on segments 1 to 4; segments 1 and 2 bluish laterally; segments 5 to 8 and 10 black, an apical triangular blue dorsal spot on segment 8 covering its apical third; segment 9 entirely blue except on the lower part of the sides.

Anal appendages black; superiors broad at base, tapering slightly to the middle, at which point they are strongly angulated downwards and inwards, the apical half forming a broad laminated plate, hollowed out on its inner side and with a small upper spine at the point of angulation. Inferiors very intricate, of the same length as superiors, very broad at base, ending in an irregular process shaped like the inverted head of a duck with its bill gaping widely, the similarity being heightened by a small raised black process which marks the eye of the duck. The basal half above is buttressed by a thin translucent lamina. Female unknown.

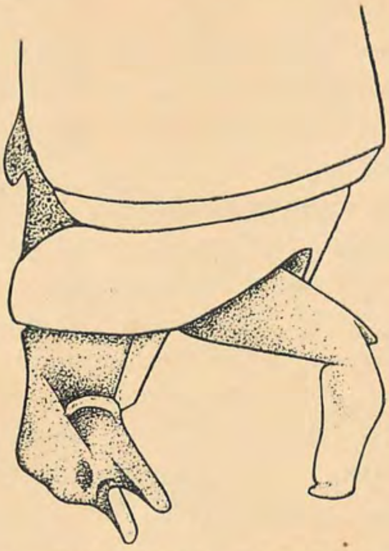

Fig. 2. *Drepanosticta anascephala* sp. nov., male. Anal appendages viewed from the left side.

Habitat.—Pu Tat, Laos, about 1,200 m. A single male collected by Dr. A. Kerr, April 22, 1932, in evergreen forest.

It appears to be related to *D. quadrata* (Selys) by the shape of the pterostigma and its colouring, but differs by its larger size, much higher nodal index, and the curious shape of the inferior anal appendages.

Copera marginipes (Ramb.).

A male and female from Nam Yuak, Laos, April 26, one teneral male from Pak Muang, Laos, April 24, and one adult female from Hat Kam, Wiengchan, Laos, April 28, 1932.

This species has a wide distribution from Western India throughout southern Asia. It shows a great diversity in its markings, especially those on the head, which circumstance has given rise to the description of a number of subspecies which do not appear to be of greater value than varieties.

Coeliccia montana sp. nov.

Male. Abdomen 42 mm. Hindwing 24 mm.

Head: labium yellow; labrum glossy black, bases of mandibles, genae and anteclypeus pale blue; rest of head black with a small triangular pale blue spot on the outer side of the ocellar space and pyriform postocular pale blue spots; eyes brown.

Prothorax black, the sides of middle lobe only pale blue changing to creamy yellow below.

Thorax black on dorsum to beyond the humeral suture marked with narrow irregular antehumeral blue stripes, the inner border of which is quite straight but the outer very irregular; laterally pale blue with a narrow black stripe on the postero-lateral suture; beneath pale yellowish, unmarked. Legs pale yellow, femora broadly black on extensor surface, the black encircling the limb at the distal end; tibiae black on flexor surface.

Wings hyaline; pterostigma black, covering nearly 2 cells, broader and deeper than the cells on either side of it; 18 postnodal nervures in forewings, 17 in the hind· *Riv+v* and *IRiii* arising proximal and distal respectively of the nervure descending from the node; 3 discal cells in all wings; discoidal cell of hindwing rather longer; *Ac* situated about midway between the two antenodal nervures, *Ab* arising slightly proximal to *Ac*.

Abdomen black on dorsum, yellow on the ventrum, the yellow passing dorsally subapically on segments 3 to 7 and again as a narrow basal interrupted annule on segment 3; segments 1 and 2 broadly yellow on the sides; segment 8 unmarked; segments 9 and 10 broadly pale blue on dorsum and sides, or pale creamy yellow in the young state, the lower parts of sides black.

Anal appendages creamy yellow; superiors slightly longer than segment 10, ungulate, slightly constricted at base and with a broad robust ventral black pointed spine situated rather nearer the apex than base of appendage, and directed downwards and inwards. Inferiors longer than superiors, very broad at base, then cylindrical, very sinuous and with the apical ends curling gently inwards and ending in a fine black point.

Habitat.—Muang Huang, Laos. A single male collected by Dr. A. Kerr, March 31, 1932. This new species belongs to group II, *didyma* Laid., in which *Riv+v* arises proximal to and *IRiii* distal of the nervure descending from the node. It is distinguished from other species of this group by the long, narrow, widely separated, irregular antehumeral stripes; from *C. brachysticta* Ris, which has rather similar markings, by the labrum black, not blue, and by the shape of the anal appendages; from *C. loogali* Laid., which has similar but regular antehumeral stripes, by segments 9 and 10 pale coloured on dorsum instead of black and by the shape of the anal appendages; *C. flavicauda* Ris has the abdomen similarly coloured but the thoracic markings are entirely different and the same may be said for *C. cyanomelas* Ris. From *C. membranipes* (Ramb.) it differs by the anteclypeus blue, the antehumeral stripes straight and with an irregular outer border, by the whole of segments 9 and 10 blue or pale yellow and by the inferior anal appendages pale yellow instead of black.

Coeliccia chromothorax (Selys).

Two males and a female from Pak Muang, Laos, 600 m., April 25, 1932. The type comes from Upper Burma where it is not uncommon near Maymyo; I have seen specimens from Siam and Annam so that it appears to have a scattered distribution throughout Burma, Malaysia, and Indochina. The present specimens do not differ from Burmese examples.

Calicnemis erythromelas Selys.

A single male from Muang Awn, Laos, about 900 m., April 7, 1932. This, the most beautiful species of the genus, is distributed from Burma to Annam and may be distinguished by its very slender build and by the alternating black and citron yellow stripes on the head. A rare species.

Caconeura verticalis verticalis Selys.

A single pair from Pak Muang, Laos, 600 m., taken *in cop.* by a small stream, April 24, 1932.

This species and its subspecies is distributed over southern Asia from the Western Ghats of India to Borneo. The male of the present examples differs from type in that the nervure *Cuii* (superior sector of triangle Selys) ends at one cell beyond the nervure descending from the node in the forewing and 3 cells beyond that level in the hind. The anal bridge (*Ab*) is practically obsolete in the forewing, and only just visible in the hind. It forms a distinct marginal cell however in the wings of the female.

The male specimen has been badly broken up.

Ceriagrion azureum (Selys).

A comparatively rare species whose distribution extends from Assam to Siam. A single male collected at Muang Awn, 900 m., April 7, 1932, and not differing from type in any way.

Ceriagrion pallidum sp. nov.

Male Abdomen 36–38 mm. Hindwing 25 mm.

Head: labium pale yellow; labrum, genae, clypeus and frons pale olivaceous, the vertex a little darker, a broad dark reddish band traversing its posterior portion and the occiput; behind occiput and eyes bright greenish yellow; eyes olivaceous.

Prothorax and *thorax* bright olivaceous changing to yellow on the sides and beneath, but the latter obscured with dense white pruinescence. Legs palest yellow, almost white, with short black spines.

Wings hyaline palely tinted with olivaceous; pterostigma diamond-shaped, small, covering 1 cell, blackish brown in colour; 15 to 16 postnodal nervures in the forewings, 13 to 14 in the hind; *Ac* meeting *Ab* at posterior border of wings.

Abdomen white from segments 1 to 6; segments 1 and 2 tinted with palest blue; segments 7 to 10 dull greenish blue, much darker than the preceding segments; segments 1 to 7 with narrow black apical rings, whilst segment 9 has a small dark brown spot on each side at the middle of the ventral border.

Anal appendages reddish brown tipped with black, of equal length, slightly shorter than segment 10; superiors bluntly conical, narrow and cylindrical at the base and with a broad obtuse spine on the inner ventral aspect; inferiors very broad at base, then tapering, cylindrical and ending in a short inwardly directed spine; seen from above these appendages curl in towards one another so that their apices meet.

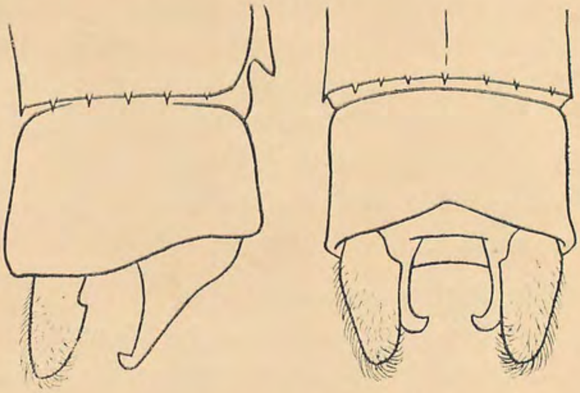

Fig. 3. *Ceriagrion pallidum* sp. nov., male. Anal appendages viewed from the right side and dorsum.

Habitat.—Muang Cha, Laos, about 1,100 m., in scrub jungle by stream, April 9 and 18, 1932. Three adult males collected by Dr. A. Kerr. This interesting new species appears to be related to *C. azureum* and *C. olivaceum*, especially to the former. The white abdomen with its black rings is strongly reminiscent of the so-called "ghost forms" of *Copera*, and this colouring, unique in the genus, will at once serve to distinguish it from all others.

Ceriagrion olivaceum Laid.

A single female from Nam Yuak, April 26, 1932. The determination of this specimen is by no means certain, as it might well be the female of the new species described above. The sides of the thorax are bluish green whilst beneath it is densely pruinosed white; the nodal index is the same as *C. pallidum* as also are the measurements of abdomen and wings, but the labrum and clypeus are pale whitish yellow and the head above is uniform olivaceous. Without more material, it must be determined as belonging to *C. olivaceum*.

Archibasis mimetes praeclarum (Fraser).

A single male from Borikhane, Laos, March 27, 1932, " found settled on damp sand." The specimen has not yet developed its full thoracic markings and resembles the type from Coorg in this respect. Distributed widely throughout southern Asia but usually a rare insect.

Orolestes selysi Macl.

A fine male specimen of this rare dragonfly was taken by Dr. Kerr at Muang Cha, Laos, about 1,100 m., in scrub beside a stream, on April 18, 1932. Its dimenions are somewhat greater than those of the type—abdomen 59 mm., hindwing 42 mm., and the dark brown markings on the wings extend distally to the proximal end of pterostigma, but otherwise it does not differ in any respect. The female still remains unknown.

Burmargiolestes flaviceps sp. nov.

Male. Abdomen 38 mm. Hindwing 29 mm.

Head: labium black; labrum, clypeus and a broad stripe on the frons extending from eye to eye, as well as the two basal joints of antennae, bright ochreous; genae and bases of mandibles black; rest of head black with two spots just in front of the anterior ocellus and one on each side of the ocellar space ochreous; eyes black.

Prothorax black with an ill-defined pale lateral stripe.

Thorax glossy black marked with white as follows: an antehumeral stripe incomplete in its upper half, the upper two-thirds of a humeral stripe resting on the humeral suture, the upper half of the antero-lateral suture and the upper third of the postero-lateral suture. Legs pale ochreous.

Wings hyaline; pterostigma elongate, twice as long as broad, but slightly expanded, all corners angulated, unbraced, covering 2 cells, blackish brown; 25 postnodal nervures in forewings, 21 to 23 in the hind; arc situated rather distal of the distal antenodal nervure; discoidal cells very narrow and elongate.

Abdomen black with broad white basal annules on segments 3 to 7 slightly interrupted on the dorsum; segment 8 with a small basal lateral whitish spot on each side.

Anal appendages closely similar to those of *B. melanothorax* (Selys) but the apical spine longer and the apical expansion more abrupt and broader; inferiors rounded, tumid and with a robust spine projecting outwards and backwards from the side.

Habitat.—Pu Tuti and Taweing, Laos, about 1,200 m., April 6 and 22, 1932. This new species differs from *B. melanothorax* by the bright ochreous face, the more extensive thoracic markings, the angulation of the corners of the pterostigma (the distal and posterior sides of the pterostigma in *melanothorax* form a continuous and marked convexity), and lastly the different shaped anal appendages. (In the Journ. Bombay Nat. Hist. Soc., Vol. XXXIV, p. 968, 1931, I have already mentioned that the form from Siam and Tonkin appeared to be distinct but I had waited for more material before describing the insect.)

Libellago lineatus lineatus (Burm.). (*Micromerus lineatus* Burm.)

Two females from Borikhane, Laos, April 30, and a pair from Muang Awn, April 7, 1932. All specimens are true to type, that is, they are quite similar to Javan forms. This species and its subspecies extend throughout southern Asia and the adjacent islands.

Rhinocypha biforata biforata Selys.

One male from Muang Baw, Laos, April 28, 1932. Does not differ from type in any way. The species extends from Burma through Malaysia.

Rhinocypha perforata perforata (Perch.).

Two males from the same locality as the last and one male from Tatom, Laos, April 2, 1932. Restricted to Indo-China. The present specimens are true to type. Two subspecies are found in N. India and Burma.

Rhinocypha iridea Selys, race *kerri.*

A single male from Muang Awn, Laos, 900 m., April 7, 1932. Taken on an open stream. This species previously has been found only in Upper Burma and its occurrence so far afield comes as a surprise. Probably it is extremely local and occurs in widely scattered colonies along the foot hills through Malayisia to Indo-China.

The single example differs strikingly from type in that the sickle-shaped iridescent bar on the hindwings extends out only to the level of the proximal end of pterostigma instead of over-lapping that organ, and completely encircles the enclosed spot on its inner side on three sides, the two markings thus taking on the character of an eye-spot. In the forewings the iridescent area stops well short of the level of the node proximally. Apart from these two differences the insect resembles the type, of which it forms a well-defined race.

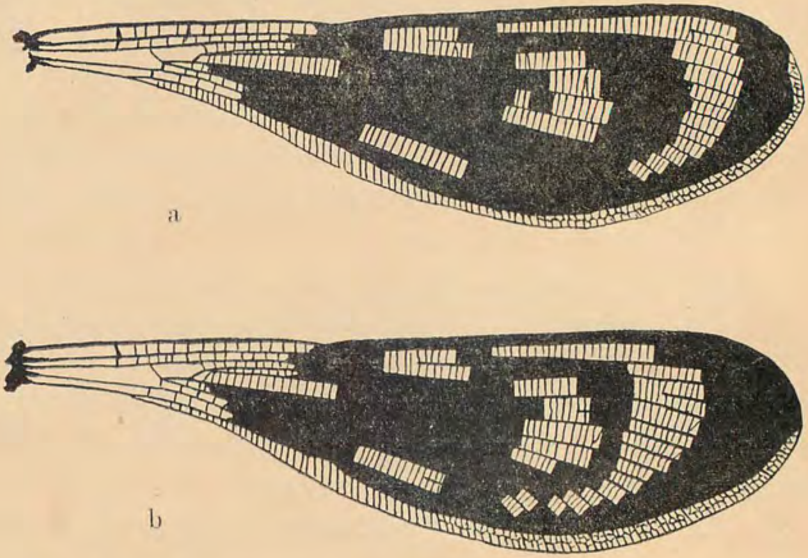

Fig. 4. *a.* Hindwing of *Rhinocypha iridea iridea* Selys, male, contrasted with that of race *kerri* (*b*).

Rhinocypha fenestrella Ramb.

One male from Muang Huang, March 30; three males and one female from Tatom, Laos, April 3; one male from Muang Cha, Chiengkwang, 1,100 m., April 10; one male from Muang Baw, April 26; one male and two females from Pak Muang, April 25; and one female from Borikhane, Laos, April 29, 1932. All specimens taken beside streams in evergreen jungle, at altitudes varying between 1,100 and 600 m.

The species extends from Burma throughout Malaysia to Borneo, although the latter is doubtful and dependent only on the data on a paper packet which may have been wrongly labelled. The present specimens are all true to type.

Pseudophaea masoni Selys.

Three teneral males from Muang Baw, Laos, April 28; one teneral male from Muang Huang, Laos, March 31; two adult males from Muang Baw, Laos, April 26; and two adult males from Tatom, Laos, April 2, 1932, the latter taken in scrub beside a stream.

Distributed from Burma to Indo-China. Like other species of the genus, remarkable variations in the size of individual specimens occurs and this is exemplified in the present material, all of which are true to type.

Allophaea brunnea Selys.

Two males, Muang Baw and Borikhane, April 28–29, 1932.

These two specimens are larger than usual, abdomen 38 mm., hindwing 33–34 mm.; the wings are very deeply saffronated or dark amber in tint, this fading to a paler yellow as the apices of wings are approached. In one specimen both fore and hind-wings are tipped with blackish brown and the whole of the head is velvety black save for an obscure yellow marking on labrum. In the other specimen, which looks fully adult, the wings are but faintly enfumed at apices and the head is strikingly marked with bright ochreous as follows: the whole of labrum which however is narrowly bordered all round with black and has a median virgule of the same colour; the bases of mandibles, genae and a very broad stripe covering the frons and confluent with the ochreous on the genae; lastly a large triangular spot on each side of the ocellar space on vertex. Other markings similar in the two specimens, the former of which is probably a very old melanotic adult.

Neurobasis chinensis (Linn.).

One male Muang Huang, March 30; one male Nam Yuak, Laos, 300 m., April 25, 1932.

A beautiful but very common species distributed throughout southern Asia and China and the adjacent islands. The two specimens do not differ from type.

Vestalis gracilis (Ramb.).

One male and two females, Borikhane, Laos, March 27; one female, Muang Baw, Laos, April 27, in dry bamboo forest; one male, Taweing, Laos, about 400 m., April 5; one female, Muang Huang, Laos, March 31, 1932, beside a small stream in evergreen forest.

Distributed from Western India to Indo-China. Laidlaw does not mention it in his list of the dragonflies of the Malay Peninsular but as it is very common in Lower Siam, it must occur there.

The Malaysian forms differ from those of W. India by the broad hyaline iridescent area on the forewings extending from near the base to just short of the apex of the wings, this area bordered narrowly by a stripe of yellow tinted wing along the costa and extreme apex. The whole of the hindwing is also tinted with yellow and strongly contrasted with the untinted forewing. The apices in both sexes are very faintly enfumed. The Western India forms are more like *V. apicalis* and have the apical marking much better defined. Rambur's type, which comes from Bombay, is however, according to the description, similar to the Malaysian form. Possibly the untinted form from the Western Ghats of India is a distinct subspecies. The present examples are true to the Rambur type.

Mnais earnshawi Williamson.

One pair, Pak Muang, Laos, about 600 m., April 25; two teneral females from the same locality and on the same date; one male, Muang Awn, Laos, April 7, 1932, taken by the side of a small stream.

Both the adult males have the dorsum of thorax, end segments of abdomen and frons and vertex densely pruinosed white, but one of the males has the latter barely apparent and, in this specimen, the wings are a deep amber tint only to as far as half way from node to pterostigm, whereas in the other they are tinted richly to the apices. The head therefore is the last part to become pruinosed and the wings become progressively deeper in tint as age advances. The pterostigma in these two is a deep blood red and is platystictine in shape.

In the females, the wings are untinted and the nervures a bright ochreous; the pterostigma is palest olivaceous and varies widely in shape, although typically platystictine *in shape* as in the male but considerably smaller. Moreover, even in the wings of individual specimens, differences in shape are seen; thus in one of the specimens it is well formed in two wings, small and triangular in another and merely represented by a blurring of one nervure in the fourth wing.

Mnais andersoni Selys.

Two pairs, Pu Tat, Laos, about 1,200 m., April 21; two males, Muang Awn, about 900 m., April 8, 1932.

All the specimens are adult, the males have the wings tinted with greenish yellow, venation black, pterostigma rather elongate, squared distally, pointed proximally and deep blood red in colour; the terminal segments of the abdomen are densely white with pruinescence but no other part of the body is thus marked. The females are similar but the pterostigma is greyish in colour and quadrate or the costal side shorter than the posterior, and is decidedly smaller than in the male. So far as these specimens of *Mnais* are concerned, they offer no difficulties in separating them into *earnshawi* and *andersoni* respectively.

Leucopteryx hetaerinoides gen. et sp. nov.

Male. Abdomen 60-62 mm. Hindwing 47 mm.

Head: labium black, lateral lobes finely bordered with pale yellow; labrum, bases of mandibles and the anterior aspect of the penultimate segment of antennae bright yellow ochre, the former narrowly bordered with black and with a small median basal point of the same colour; anteclypeus black; postclypeus metallic green with a brilliant cupreous reflex; frons, vertex and occiput duller metallic green, the former with a median patch of pruinosed white and the vertex with a similar patch behind each antennae. Eyes dark brown, black behind with a patch of pruinescence at the middle.

Prothorax brilliant metallic green with golden or cupreous reflex and the sides pruinosed white.

Thorax brilliant metallic emerald green, the sutures finely black, the posterolateral suture broadly so. Beneath and the lower posterior angle of the metepimeron densely pruinosed white.

Legs black, thinly pruinosed white, the coxae and trochanters more densely so.

Wings hyaline save for a patch of opaque chalky white at the base of each hindwing which is bounded anteriorly by the subcostal nervure, distally by the level of the distal end of the quad-

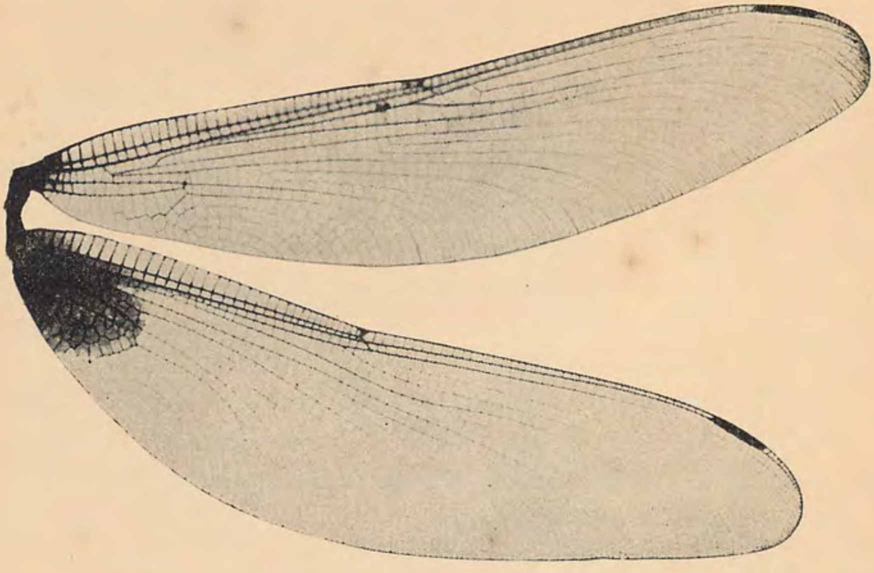

Fig. 5. Wings of *Leucopteryx hetaerinoides* sp. nov., male.

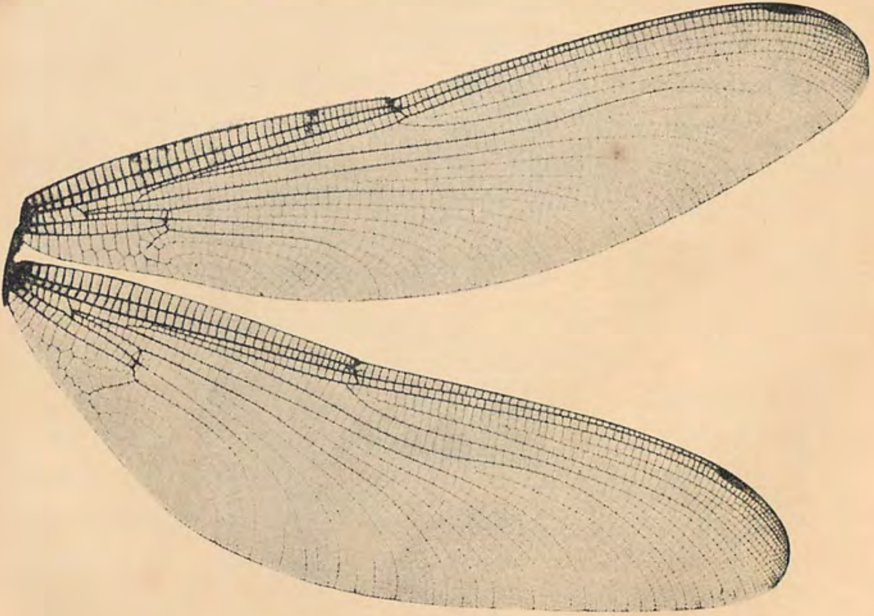

Fig. 6. Wings of *Leucopteryx hetaerinoides*, female.

rilateral, the nervure *1A* and its basal fork as far as the hinder border of wing. The nervures in this white area black, forming a fine network against the chalky white background; costa non-metallic; pterostigma about 3 to 3.5 mm. in length, acute proximad, dark brown enclosed in black nervures; about 45 antenodal nervures and 45 postnodals in forewings, 34 antenodals and 36 postnodals in the hind; median space traversed by 6 nervures in forewings, 4–5 in the hind; discoidal cells traversed 6 to 8 times; 11 to 14 cubital nervures traversing the basal space.

Abdomen brilliant metallic green at base changing to a duller and cupreous metallic green towards the end segments; segments 3 to 7 with narrow black basal annules; segments 1 and 2 and the base of 3 thinly pruinosed as well as the whole of the ventral aspect of the abdomen.

Anal appendages: superiors about one third as long again as segment 10 which is finely keeled at apical end of dorsum, forcipate, ungulate and obtuse at apex and with a row of gradually lengthening spines along the outer border, black pruinosed white on the inner side; inferiors shorter than superiors, broad at base, then tapering slightly to apex which is very obtuse.

Female. Abdomen 58 mm. Hindwing 50 mm.

Similar to the male in most respects; labrum rather more broadly bordered with black; the pruinosed spots on head but slightly evident; thorax a duller metallic green and with a narrow pale ochreous stripe framed in black on the posterolateral suture and some spots of the same colour on the trochanters; segments 1 and 2 of abdomen green metallic, remaining segments dull cupreous metallic changing to black with a steely reflex on the end segments. Wings uniform pale amber or pale burnt brown, the opaque basal area absent; pterostigma smaller, only 2 mm. in length, bright opaque chrome yellow finely framed in black nervures; venation reddish brown similar to the male. Vulvar scales extending to end of abdomen, black; anal appendages as long as segment 10, conical, pointed at apices, black.

Habitat.—Muang Cha, Laos, about 1,100 m., April 10, 1932 Three males and a female collected by Dr. A. Kerr. There is a single male in the collection of the Jardins des Plantes, Paris, which I found labelled incorrectly as the male of *Echo maxima* Martin and by him. The type of the latter is a female, an unique specimen, the wings of which are totally different from the present species as is seen in the accompanying figure. *E. maxima* comes from Annam but probably extends into the Laos country.

Leucopteryx may be related to *Archineura* but the fine reticulation about the anal loop and field is absent and the neuration of the opaque area is as open as the rest of the wing; the arc is very oblique and but slightly angulated; *Cuiia* is bordered by 4 cells instead of 8. It agrees with genus *Climacobasis* by the node nearer the pterostigma than base, thus differing from genus *Echo*. The generic features are the reticulation of the median space which is as long as the discoidal cell, the presence of an opaque area in the hind-wings of male and the pterostigma differing in the sexes.

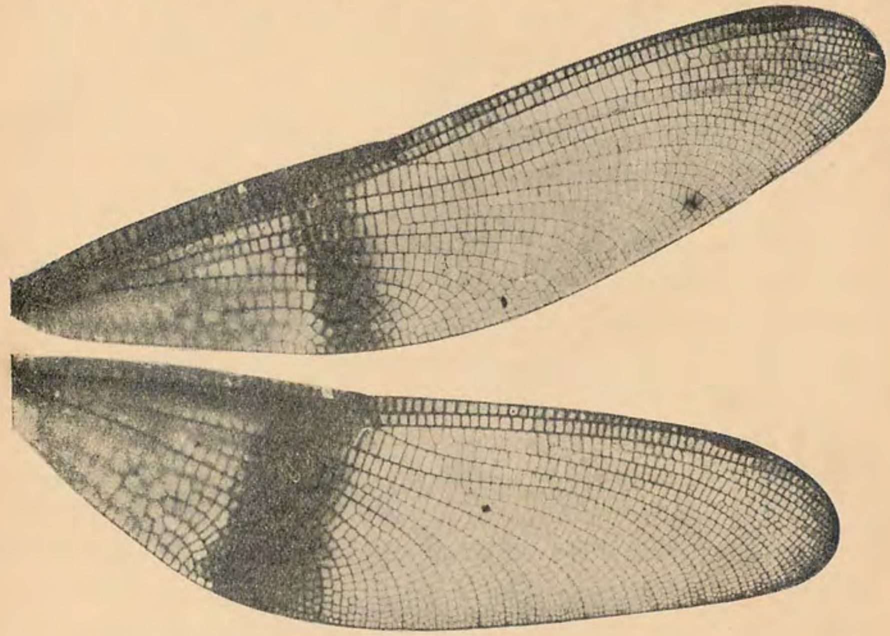

Fig. 7. Wings of *Echo maxima* Martin, female.

Calopteryx laosica sp. nov.

Male. Abdomen 60 mm. Hindwing 45 mm.

Head: labium black; labrum black marked with a narrow elongate bright ochreous spot on each side; bases of mandibles bright ochreous; anteclypeus metallic blue; postclypeus brilliant glossy metallic emerald green; rest of head metallic emerald green; eyes dark brown.

Prothorax and *thorax* metallic emerald green, the latter with the underside, the lower part of each side, the postero-lateral suture and the posterior and lower third of the metepimeron pale ochreous. Legs very long and slim, black.

Wings deep amber, paler and clearer at extreme base and at the apical fourth, the area between these two points gradually deepening distally: in the hindwing a rather broad bar of blackish brown adjacent to the apical pale portion of wing extending from costa to posterior border of wing and continued along the latter as a ragged border basally as far as the middle of wing. The forewing rather paler tinted than the hind and the apical pale portion more extensive; pterostigma absent in all wings; 55 antenodal nervures and 165 postnodals in all wings; discoidal cells traversed 15 times in all wings; 18 to 20 cubital nervures; median space entire.

Abdomen brilliant metallic peacock blue and green according to which angle viewed. *Anal appendages* black; superiors half as long again as segment 10, forcipate, expanded in the apical half, very obtuse at apex, outer border with a few spines. Inferiors shorter, stouter, ungulate, broad at base, tapering to apex which is obtuse or clubbed.

Habitat.—One male from Muang Cha, Laos, about 1,100 m., April 17, 1932. Closely related to *A. cornelia* (Selys) from Japan which is of the same large size but the marking on the hindwing is entirely different. Female unknown.

Matrona basilaris basilaris Selys.

A single teneral male, Pak Muang, Laos, about 600 m., April 24, 1932. Distributed along the southern slopes of the Himalayas from Bengal to Burma, Siam, and as far as Hainan and Tonkin, but nowhere common.

Devadatta multinervosa sp. nov.

Male. Abdomen 40 mm. Hindwing 35 mm.

The specimen is teneral and the markings rather obscure but the general colour is black and the adult stage would probably be entirely black. The labrum is pale at the free border, the thorax bears an antehumeral stripe on each side and close to the middorsal carina, a fine humeral stripe on the suture, a pale livid stripe on each lateral suture and the hinder half of the metepimeron. On the abdomen, the only indication of markings is paired white spots at the base of all segments from 3 to 7.

The wings show broad differences in details of neuration to those of *D. argyroides* and will necessitate some modifications in the generic description. Pterostigma similar to that of *D. argyroides*, covering 4 cells, dark brown; 13 antenodal nervures in the forewing of which the first five show correspondence between the first and second series, 44 to 49 postnodals; 11 to 13 antenodal nervures in hindwing of which the first 6 correspond, 37 to 39 postnodals; 4 to 5 cells in the discoidal cells; 5 to 7 (usually 5) accessory basal postcostal nervures; 2 rows of cells after the pterostigma; other details closely similar to those of *D. argyroides*.

Anal appendages black; superiors distorted and difficult to describe, about half as long again as segment 10, broad at base, tapering to apex, apparently similar to those of *D. argyroides*; inferiors much shorter, tumid, rounded prominences.

Habitat.—Pu Tat, Laos, about 1,200 m., April 22, 1932. A single rather teneral male taken in jungle near a stream. Easily distinguished from *D. argyroides* by the much higher nodal index and other details in venation described above.

Amphithemis kerri sp. nov.

Male. Abdomen 25 mm. Hindwing 28 mm.

Head: labium bright citron yellow, middle lobe black; labrum black; bases of mandibles, clypeus and lower half of frons anteriorly bright citron yellow, the upper half of frons and its superior surface, as well as the vesicle, steely blue metallic; eyes brown, black behind with some scattered citron yellow spots; occiput black with a geminate yellow spot behind.

Prothorax black, with the anterior lobe above, a quadrate spot on the hinder part of middorsum of middle lobe and the whole of the posterior lobe creamy yellow, the latter lobe emarginate at its centre, bilobate and fringed with long hairs.

Thorax black with a narrow greenish-white stripe bordering the middorsal carina on each side and ending in a rounded spot below, which latter is partially obscured by the overhanging posterior lobe of prothorax. Laterally broadly bright citron yellow with a broad oblique black stripe at the middle bordering the metepimeron and bifurcated below. Beneath yellow with a broad lyrate black marking confluent laterally with the lateral black stripe. Legs black, trochanters yellow.

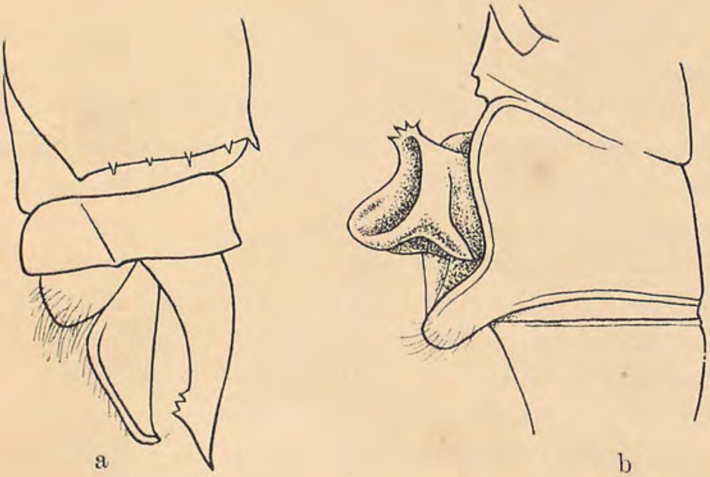

Fig. 8. *Amphithemis kerri* sp. nov., male. *a*. Anal appendages seen from the left side. *b*. Genitalia.

Abdomen black marked with citron yellow as follows: segment 1 with a quadrate spot on the middorsum and a large spot on each side; segment 2 with a narrow middorsal bilobate stripe and a broad L-shaped spot on each side; segments 3 and 4 with a broken stripe on each side, the former with a ventral tapered spot at base; segment 5 with a very small basal subdorsal spot only; segment 6 unmarked; segment 7 with a pair of large oval spots on dorsum covering half the segment and only narrowly separated by the middorsal carina; remaining segments unmarked.

Wings hyaline, pterostigma black, short, covering 2½ cells;

nodal index $\frac{9\text{–}14}{9\text{–}13}\Big|\frac{15\text{–}9}{14\text{–}9}$; 1 or 2 cubital nervures in the forewings, 3 in the hind; supratriangles traversed once or twice in forewing, once in the hind; discoidal triangles in forewings entire, traversed once in the hind; discoidal field with a single row of cells to beyond the proximal end of bridge or to level of node; anal loop in hindwing 4-celled; 1 row of cells between *Riv+v* and *Rspl* in both wings; 2 accessory nervures to the bridge.

Anal appendages black; superiors twice as long as segment 10, broad at base then constricted, cylindrical and again broadened to form an obtuse subapical spine which bears two or three fine teeth; apex tapered and acuminate. Inferior appendages triangular, nearly as long as superiors, curled slightly upwards at apex which is tapered.

Genitalia: lamina produced, emarginate at middle; anterior hamules massive, shaped like an anvil with the anterior end bearing several small spines; posterior hamules concealed; lobe narrow, produced, tongue-shaped.

Female. Abdomen 24 mm. Hindwing 30 mm.

Coloured and marked similarly to the male but a small upper humeral yellow spot present on thorax; the lateral stripes on the abdomen are also found on segments 3 to 6, decreasing in length from former to latter. Vulvar scales triangular, deeply cleft at apex. (Some ova attached to these scales are pale yellow and oval in shape.) The ventral plate on segment 9 with some tactile bristles on its free border which suggest that the ova are deposited *ex aqua*, probably on leaves overhanging water as in the case of genus *Tetrathemis*.

Wings tinted with yellow, especially at the extreme base; 2 to 3 cubital nervures in hindwing, but other details of venation similar to the male.

Habitat.—One male, Taweing, Laos, about 500 m., April 4, in evergreen forest; one female, Muang Baw, Laos, April 27, 1932.

This new species is easily determined by the shape of its genitalia and by the shape of the anal appendages. From *A. vacillans* by these latter of nearly even length and the superiors curving down and with but a single curve; from *A. curvistyla* by the ventral spines on the superior appendages confined to the apex and the abdomen without red markings; from *A. mariae* by the base of abdomen without any red on it; the genitalia are quite distinct from all three species.

Lyriothemis bivittata Selys.

A rare species which extends from Assam through Burma to Tonkin. Dr. Kerr's collection contains a single female from Muang Baw, Laos, April 27, 1932.

Cratilla lineata (Brauer).

One female from Muang Cha, Laos, 1,100 m., April 17, 1932. A not uncommon species occurring in scattered colonies from Burma to Borneo and the Philippines. Dr. Ris gave it as synonymous with *C. calverti* Först., from Malabar and Ceylon, but in a letter written to me a few years ago opined that the two might be distinct, after comparing *C. lineata* from Malaysia with specimens I had sent him from the Nilgiris, W. India. Since then I have taken it as far south as Ceylon.

Orthetrum triangulare Selys.

A montane species which, in S. India, I have not found below 6,000 ft. Dr. Kerr's collection however contains a single male from Muang Awn, Laos, about 1,000 m., April 8, 1932. In N. India it is found at a lower level, probably due to the difference in longitude; it is essentially a palaearctic insect, or at least of that extraction.

Diplacodes trivialis (Ramb.).

A single female, Taweing, Laos, 600 m., April 6, 1932. Perhaps the commonest dragonfly in the oriental region and found everywhere and at all altitudes up to 7,000 ft.

Neurothemis fulvia (Drury).

One female, Tatom, Laos, April 3 1932, on rocky limestone hill.

A common species extending from W. India to Tonkin and occurring in colonies like *C. lineata*. The single specimen is a heteromorph but I have seen andromorphs from Siam, although these are quite rare. Dr. Ris on his monograph on the Libellulinae was seemingly not aware that andromorph females occurred; in Malabar such forms are not uncommon and may be confined more strictly to that locality.

Neurothemis fluctuans (Fabr).

One female, Borikhane, Laos, in bamboo forest, March 27; one male, Muang Baw, Laos, April 27, 1932, and one female from the same locality.

A locally common species extending from Burma to Borneo and Sumatra. One of the females is a heteromorph.

Brachythemis contaminata (Fabr.).

An exceedingly common species confined to the plains and extending from Western India to China, Japan, and Philippines. One male from Borikhane, Laos, April 30, 1932.

Trithemis aurora (Burm.).

One male, Muang Baw, Laos, April 28, 1932. A species with similar habits and distribution to the last and common everywhere it occurs.

Zygonyx immaculata sp. nov.

Male. Abdomen 39–41 mm. Hindwing 46–49 mm.

Head: labium with middle lobe black, lateral lobes yellow; labrum black; anteclypeus pale brown; postclypeus bright yellow with a transverse stripe of glossy dark brown, shaped and situated like a drooping moustache; frons in front and at the sides bright yellow, above, and an area slightly overlapping its foreborder violet metallic as well as the vesicle; occiput black; eyes dark brown.

Prothorax warm brown, its anterior collar bright yellow.

Thorax dark reddish brown, the dorsum with a bluish-green metallic reflex and two very broad metallic bluish-green stripes on each side. Legs dark reddish brown, almost black.

Wings hyaline without basal or apical dark markings; 2 rows of cells between *IRiii* and *Rspl*; 2 cubital nervures in the forewings, 1 in the hind; proximal border of discoidal triangle in forewing at a right angle to $Cuii + IA$; midrib of anal loop bent at a right angle, the outer border at an acute angle; all discoidal triangles traversed once; discoidal field of forewing with 3 rows of cells; nodal index

$$\frac{11\text{–}17 \mid 17\text{–}10}{12\text{–}12 \mid 11\text{–}12}, \ \frac{10\text{–}15 \mid 12\text{–}15}{13\text{–}11 \mid 10\text{–}11}.$$

Abdomen black, the sides of segments 2 and 3 broadly yellow as well as a narrow postjugal stripe on the latter segment. All other segments unmarked.

Anal appendages, black, shaped similarly to those of *Z. iris malabarica* but there are about nine small spines on the under surface of superiors near the base instead of only 3 or 4.

Habitat.—One male, Pak Muang, Laos, about 600 m., April 24; one male, Hat Kam, Wiengchan, Laos, April 28, 1932.

This new species is a large one, as large as any in the genus. It differs from *Z. iris aenea (Z. iris insignis)* from Siam by the base and apex of wings without dark markings and by the thorax without a yellow humeral stripe. It closely resembles *Z. iris ceylanica* from Ceylon but the face is broadly marked with yellow unlike that species, the angle formed by the discoidal triangle with *Cuii*$+$*IA* is a right angle and not obtuse as in *Z. ceylanica* and the lateral lobes of labium are broadly yellow instead of nearly all black. In addition to this new species, *Z. iris ceylanica* and *Z. iris aenea*, *Z. iris isa* is the only other species in which the yellow identification mark on segment 7 is absent, and from this species the new species is determined by the discoidal field of forewing with 3 rows of cells instead of only 2.

The genus *Zygonyx* which formerly included only three species has now grown to one of the largest in the subfamily *Libellulinae*; Dr. Ris, for geographical reasons only, separated *Zygonyx* from genus *Pseudomacromia*, but with the discovery of *Z. torrida isis* (a subspecies of *P. torrida torrida*) in three different localities in India, the latter genus, an African one, must now be merged in *Zygonyx*.

Macromia sp.

Abdomen 46 mm. Hindwing 41 mm.

Head: labium with middle lobe yellow, lateral lobes blackish brown; labrum black with two small citron yellow spots at base; anteclypeus blackish brown; postclypeus bright citron yellow; frons and vesicle steely black, the former very deeply notched, the latter minutely so; occiput and behind eyes glossy black; eyes brown, probably deep blue during life.

Prothorax black narrowly bordered with citron yellow in front. *Thorax* metallic bluish-green marked with bright citron yellow as follows: narrow antehumeral stripes extending up the lower two-thirds of dorsum, the antealar sinus and a narrow oblique stripe on each side of thorax. Legs blackish-brown.

Wings hyaline, saffronated at extreme base only, but a very pale tinting of apices of forewings; pterostigma black, covering 1½ cells; 6 to 8 median nervures in forewings, 4 in the hind; anal loop with 16 to 17 cells; discoidal triangle traversed once in one forewing; hypertrigones traversed 4 to 5 times in forewings, 3 in the hind; 17 antenodal nervures and 7 postnodals in the forewings, 11 to 12 antenodals and 10 to 12 postnodals in the hind.

Abdomen black, marked with citron yellow as follows:—segment 2 very broadly on the sides and dorsum, only a small dorsal area black at the apex; segment 3 broadly at the sides of base and a pair of yellow dorsal spots on the basal side of jugal suture; segments 4 to 6 similar but without the basolateral spot, and the dorsal spots very small on segment 6; segment 7 with a broad saddle-shaped dorsobasal spot covering rather more than one third the length of segment; segment 8 with a small basolateral ventral spot; segments 9 and 10 unmarked. Anal appendages black, shortly conical; vulvar scales distorted and obscured.

Habitat.—Pak Muang, 600 m., April 24, 1932. This species belongs to group *calliope*, characterized by segments 2 to 5 mat black, the humeral yellow stripe present, a well-defined stripe on face, and the dorsal spine on segment 10 absent. It is thus allied to *M. ida* and *M. miniata* from India, but without the male it is impossible to determine it with any accuracy.

Macrogomphus borikhanensis sp. nov.

Male. Adbomen 57 mm. Hindwing 40 mm.

Head: labium brownish yellow; labrum black with two large lunate yellow spots at base; bases of mandibles yellow; ante and post-clypeus black, the latter with a large triangular yellow spot on each side against the eyes and a smaller spot on the lower border each side near the middle line; frons black in front, broadly yellow above, this area divided into two spots by the floor of the sulcus black and confluent with the black in front and at base; vertex black; occiput with sinuous posterior border fringed with short stiff black hairs, black with a large medial yellow spot in front; eyes dark green, black behind.

Prothorax with the anterior and posterior lobes bright citron yellow, middle lobe black with a small geminate yellow spot on the hinder part of middorsum and a short yellow stripe on each side curving forwards along its lower border.

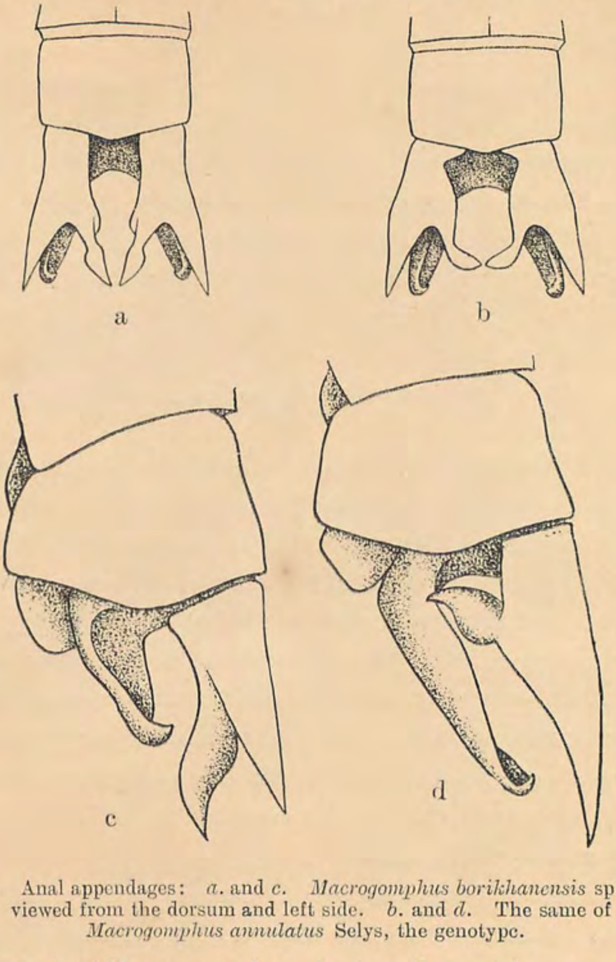

Fig 8. Anal appendages: *a.* and *c.* *Macrogomphus borikhanensis* sp. nov., viewed from the dorsum and left side. *b.* and *d.* The same of *Macrogomphus annulatus* Selys, the genotype.

Thorax black marked with bright citron yellow as follows:— rather short and stout antehumeral stripes broadened below, two broad oblique lateral stripes, one of which is posthumeral, the other lying along the anterior border of metepimeron; black beneath.

Legs black, coxae and trochanters marked with yellow.

Wings hyaline; pterostigma black, rather short, unbraced, covering 4 to 5 cells; anal loop 3-celled; 2 cubital nervures in fore-wings, 1 in the hind; a basal incomplete antenodal nervure in all wings; nodal index $\frac{9\text{–}17}{10\text{–}12}\Big|\frac{16\text{–}9}{10\text{–}10}$.

Abdomen black ringed and marked with yellow as follows:—segment 1 with a middorsal spot and a large ventro-lateral on each side; segment 2 with a bilobate middorsal stripe tapering apically and two large spots on each side, a basal spot which includes the oreillets, which are of great size and narrowly edged with black; lastly a small linear apical spot; segments 3 to 7 with very broad basal rings covering nearly half the length of segments 3 to 6 and quite half the length of segment 7, each being bisected by the fine black jugal suture; segment 8 black with a small triangular basolateral spot only; segment 9 with a similar but still smaller spot, whilst segment 10 is unmarked.

Anal appendages: superiors nearly as long as segment 10, yellow tipped with black, deeply forked at half their length, the outer fork or branch directed straight back and tapered to a fine point, the inner branch directed inwards at an acute angle to the outer branch and slightly longer than it but also tapering to a fine point; seen in profile, this latter branch is curved down and then up again at its apex, tumid at its middle and presenting a robust tubercle near its root. Inferior appendages black, very broad at base and almost at once sending out on each side a long slender divaricate branch, the extreme apex of which is turned up and which is as long as the superior appendages.

Genitalia: lamina depressed, narrowly arched and minutely emarginate; anterior hamules narrow, long flattened processes, rather obtuse at apex; posterior hamules much broader, foliate, truncate at apex, hollowed out within, equal in length to anterior hamules; lobe elongate, olive shaped, black.

Female. Abdomen 53 mm. Hindwing 45 mm.

Differs in a few respects from the male; the yellow spots on labrum larger; a transverse yellow stripe on the anteclypeus; the yellow spots on postclypues larger and confluent except at the middle; the upper yellow spots on frons broadly confluent; prothorax with the yellow on posterior lobe confluent with the geminate spot on middle lobe and also with the lateral spots; markings on thorax correspondingly broader and, in addition, an upper lower spot between the lateral oblique stripes. Abdomen similar to the male. Anal appendages short, conical, pale yellow. Wings with dark brown rays at base in the costal, subcostal and basal spaces, extending out as far as the arc in the former and halfway to the nervure *Ac* in the latter; pterostigma longer, covering 5½ to 6 cells; nodal index $\frac{11\text{–}18}{10\text{–}14}\Big|\frac{18\text{–}11}{15\text{–}10}$; other details similar to the male.

Habitat.—Borikhane, Laos, March 27, 1932. A pair probably taken *in cop.* The shape of the anal appendages shows some relationship to *M. annulatus.* The following points will serve to distinguish this new species from others:

M. parallelogramma. Has no baso-ventral tubercle to inner branch of superior appendages.

M. annulatus. Inner branch of superior appendages angulated strongly inwards and a little backwards and bent on itself.

M. kerri. Has a long baso-ventral spine directed analwards arising from the inner branch of superior appendages in place of the basal tubercle.

M. seductus. Inner branch of superior appendages shorter than the outer and the tubercle at base of former replaced by a spine.

M. montana. Has a humeral yellow stripe, the only species in which this occurs.

M. wynaadicus. Male unknown. Known only from W. India.

M. robustus. Anal appendages unknown. Known only from N. India.

Onychogomphus saundersii Selys ?

Female. Abdomen 38 mm. Hindwing 31 mm.

Head: labium yellow; labrum yellow broadly bordered with black; bases of mandibles and anteclypeus yellow; postclypeus and